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ABSTRACT

A study of the possible transfer of reading skills from a first language other than English to English, called script-carryover effects, focused on two aspects of the written language: (1) the manner in which the script represents information about sound and meaning, and (2) whether or not the script uses the same graphemic characters as English. Three groups of people whose first languages were Japanese, Arabic, and Spanish were selected for three experiments because their script systems differ from English on these dimensions. In the first experiment, the groups were tested with a timed same-different matching task using English words and nonsense words both alone and in strings, measuring the efficiency of visual processing. In this test, the Japanese speakers showed a distinct advantage in both speed and error rates, with the Arabic speakers being the slowest, contrary to two of the three hypothesized outcomes. The second experiment used abstract shapes rather than letters as stimuli for comparisons. In this task, the Japanese maintained their overall advantage both in times and errors, and the Spanish and Arabic groups performed about equally. The third measure was the Slosson Oral Reading Test, measuring the ability to translate from spelling to pronunciation. On this task, the Japanese were slowest and the Spanish fastest. The overall results suggest a script-carryover effect from Japanese to English, especially for visual processing, but more research is needed. (MSE)

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Learning to Read English as a Second Language: Effects of First Language Script System and Cultural/Educational Background

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Successful reading depends upon the smooth and coordinated execution of a number of theoretically dissociable component skills. These can range from elementary visual processing to the use of semantic knowledge to support comprehension (Carr, 1981; Frederickson, 1978; Singer, 1982; Stanovich, in press). For highly practiced readers these component skills constitute a finely tuned system which must operate within the attentional limitations of the reader. Considerable evidence suggests that the visual processes which occur prior to lexical access become automatic or effortless with time, making these skills difficult to inhibit and perhaps more resistant to conscious or strategic manipulation (Stroop, 1935; Dyer, 1973; Carr, Davidson, & Hawkins, 1981; Regan, 1978, 1981; Shaffer & LaBerge, 1979).

What happens, then, when a person learning to read English already possesses a developed reading competence in some other language? What kinds of interactions can occur when reading skills in English must emerge in the presence of well established and perhaps highly automatic processes resulting from a student's extensive experience with a first language?

We have been investigating these questions with Japanese, Arabic, and Spanish speaking students enrolled in the English Language Program at our university. Our work so far has focussed on the search for what we have called script-carryover effects, or the possibility that the kinds of reading processes used in students' first language is transfering, for better or for worse,

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to the acquisition of reading skill in English. Two dimensions along which scripts can differ have been of particular interest to us: the manner in which the script represents information about sound and meaning and whether or not the script uses the same graphemic characters (or letter shapes) as English.

We chose Japanese, Arabic, and Spanish speaking students because their first language script systems differ on the dimensions of interest. Spanish speaking students should have extensive visual experience with English letter shapes while Arabic students must master a new and visually dissimilar alphabet. Unlike Spanish and Arabic students, who already know an alphabetic writing system, Japanese students must master the English alphabet as well as a new and fundamentally different method for mapping between written and spoken language, since their native script is logographic and syllabic rather than alphabetic in nature.

One good place to begin looking for script-carryover effects is in tasks that measure the efficiency of visual processing under conditions in which compensatory mechanisms, such as guessing from context, have little opportunity to play a role. We used a same-different matching task with English words, regularly spelled and pronounceable nonwords (called pseudowords), and irregularly spelled and unpronounceable nonwords (called nonsense strings). This was a speeded task in which students were instructed to indicate whether or not two such letter strings, one printed immediately above the other, were spelled the same or spelled differently. We recorded the times and error rates for each of

three booklets, each containing 48 items, one for words, one for pseudowords, and one for nonsense strings.

We had three relatively specific expectations concerning this task: (1) that Spanish students would be faster and more accurate overall because of their long-standing familiarity with the Roman alphabet; (2) that they would also show more benefit from spelling regularity as shown by the difference in speed and error rates between pseudowords and nonsense strings; and (3) that Arabic students would be the slowest, as suggested by our pilot data which indicated that Arabic students had particular difficulty perceiving the internal structure of English words.

Figure 1 shows the group means for overall speed in the matching task. Percent error per booklet is indicated in parentheses by each data point. So much for predictions. While we were correct in anticipating that Arabic students would be the slowest, we were quite surprised to find that the Japanese students showed a substantial advantage for both speed and errors. While there was a main effect of stimulus type, with pseudowords being faster than nonsense strings, the size of the difference did not change significantly across the language groups. Thus our hypothesis concerning spelling regularity was also not confirmed.

Why were Japanese students fastest at this task? One possibility is that the Japanese students are simply more efficient at processing any visual stimulus, regardless of whether or not it is composed of Roman letters. Our second visual processing test was included in the battery specifically to test for this type of outcome. This is a test of visual discrimination

which uses abstract shapes, rather than letters, as the comparison stimuli. Because we could not find a published test to suit our needs, we developed our own. Fig. 2 shows three of the 16 items on the test. Each item consists of one model and four options labelled A, B, C, or D. The task is to select the option most like the model and to write the corresponding letter on a separate answer sheet. The dependent variables were completion time (for the whole test), and percent error.

Fig. 3 shows how the groups performed on this task. The Japanese students maintained their overall advantage, both in times and errors, but the Spanish speaking students lost ground relative to the Arabic students-in fact, the two groups are performing about equally on this task.

It seems reasonable to suppose that the lack of a difference between Arabic and Spanish speaking students on this task is due to the fact that the comparison stimuli are now equally unfamiliar to both groups. This approach accounts nicely for the relative performance levels of Arabic and Spanish speaking students, but does not explain the Japanese performance pattern.

What can be said, then, about Japanese performance on the visual processing tasks? One important observation is that the Japanese readers maintained superiority across both tasks. Whatever enabled their advantage in visual processing appears not to be specific to letter sequences in the Roman alphabet. This raises the interesting possibility that Japanese students are working in a less linguistic mode of perceptual processing in which the words and letter strings of the matching task are being

treated more like the abstract shapes and figures of the visual discrimination test. This type of visual processing might be very efficient for the rapid visual apprehension of two or more shapes, but may not be particularly well suited to the formation of phonological, lexical, or semantic codes which are important for reading. It seems worthwhile to ask, then, whether the Japanese performance pattern carries through to more integral and molar reading related tasks.

One such task is the Slosson Oral Reading Test (or SORT), which measures the ability to translate from spelling to pronounciation. An important component of the SORT task is phonological code formation, based either on rule governed mapping from spelling to phonology (as might be necessary for unfamiliar words and pseudowords), or on a paired-associate or logogen-like sight word process (as might occur for familiar words). In our version of the SORT each student saw four lists with 20 items per list. Each list contained one of the four kinds of stimuli used in this task: short words, short pseudowords, long words, and long pseudowords. Besides measuring reading time, we also used the recorded protocols to estimate pronounciation accuracy.

In figure 4 I have plotted the reading times on the SORT test with words in the top panel and pseudowords in the lower panel. Spanish speaking students were faster overall and showed smaller differences in the transition from short to long stimuli. Japanese students were slowest overall and had the largest difference between shorts and longs. Our accuracy estimates indicated, however, that the Japanese students tended to be more accurate

reaction times and errors greatly increases the analytical power of the design. I should note that this study is still in progress and that the results I'll be presenting are preliminary in nature.

Table 1 summarizes the design for the second experiment. We added variable 2, stimulus length, on the basis of the SORT scores, which showed that Japanese students slowed down drastically on long letter strings. Since the first matching experiment used stimuli that were only four letters long, we felt that the addition of long letter strings could tell us whether or not the disparity between SORT and matching performance was due purely to length effects, or, more interestingly, to differences in the types of codes necessary for the two tasks. Variable 4, response type, refers to whether or not the spelling of the two letter strings for a given trial is same or different. Times and errors for trials with differences in spelling can be broken down by the levels of variable 5, position of difference, to give indications about where in the stimulus pair differences tend to be detected most quickly. For example, an increase in times and errors as the position of difference shifts from left to right through the word pair indicates a kind of left-to-right scanning strategy, whereas a flat or inverted u-shaped pattern might reflect a more parallel or wholistic process.

I have plotted the results of interest in figure 6. The main effect of language background (figure 6A) was consistent with our earlier findings, with Japanese students showing a 500 ms. advantage overall. Figure 6B shows the interaction between language group and stimulus type, which is only marginal on the

subjects we've run so far. There is a trend, however, for Japanese students to be less sensitive to the different characteristics of the stimuli, such as familiarity and spelling regularity. Figure 6C shows the reaction times for differently spelled word pairs across the positions in the stimuli, with 1 being at the beginning and 4 being at the end. Arabic and Spanish speakers show a left to right scan pattern with relatively large position effects, particularly with respect to the detection of word initial as opposed to word final differences. Japanese students, while preserving some of the features of a left to right scan, show significantly attenuated position effects and a much smaller difference between word initial and word final reaction times. Figure 6D shows the lack of an effect concerning our predicted interaction between language group and stimulus length. If anything, Japanese students show a smaller difference between shorts and longs than Arabic and Spanish speakers, suggesting that length per se was not the problem for Japanese students in the SGRT task.

I would like to step back now from the details of visual processing and pull together the assorted strands of evidence concerning script carryover effects and language background. We've seen that Japanese students are more efficient at visually analyzing letter strings in the Roman alphabet than are Arabic and Spanish students of roughly equal reading ability. Moreover, the Japanese advantage in visual processing persists in a test of visual discrimination based on abstract shapes and figures rather than letters. Spanish students, on the other hand, were more

efficient than Arabic students on letter strings but lost this advantage in the abstract shapes test. This pattern of findings opens up the possibility that Japanese students are treating the English words and letter strings of the matching task more like the abstract shapes of the visual discrimination task. This line of reasoning seems supported by our more recent data, which indicates that Japanese students have a tendency to be less sensitive to the reading relevant aspects of the matching stimuli, such as familiarity and spelling regularity. However, the Japanese advantage did not persist on measures of spelling-to-sound translation and reading comprehension efficiency. This suggests that the type of visual processing which was so advantageous for Japanese students in the visual tasks is either ineffective or is not used in tasks that require more integrated, nonvisual codes. One possibility is that the visual processing style of Japanese students is not conducive to the formation of phonological or lexical codes which feed into more global components of reading skill. We know also that across our entire sample of second language students, reading progress over a 3 month period correlated positively, though modestly, with sensitivity to spelling regularity as assessed in the matching task. Japanese students showed significantly less reading progress during this same period, but, paradoxically, had considerably higher overall language scores, particularly in grammar and vocabulary.

The general picture seems indicative of a script-carryover effect for Japanese students of English, pertaining specifically to their visual processing of English words and letter strings.

However, we feel that much more work is needed before we can consider this possibility as anything other than tentative. Specifically, we need to know more about the nature of Japanese visual processing when they read English; not just what they're doing in the matching task but also whether or not the same kind of visual processing is being used in more complex reading-like activities which require phonological, graphemic, or lexical code formation and active comprehension processes. We are also unsure just how to distinguish between what we've been calling script-carryover effects and the more general effects of cultural and educational background. We know, for example, that first and second language instruction in Japanese high schools and universities is heavily biased toward the development of visually-based language skills (Tsuboi, 1978; Ishii & Klopf, 1980; Kitao, 1980). We are currently unsure how these cultural and educational differences ought to be interpreted, and are particularly interested in comments and suggestions in this regard. Thank you.

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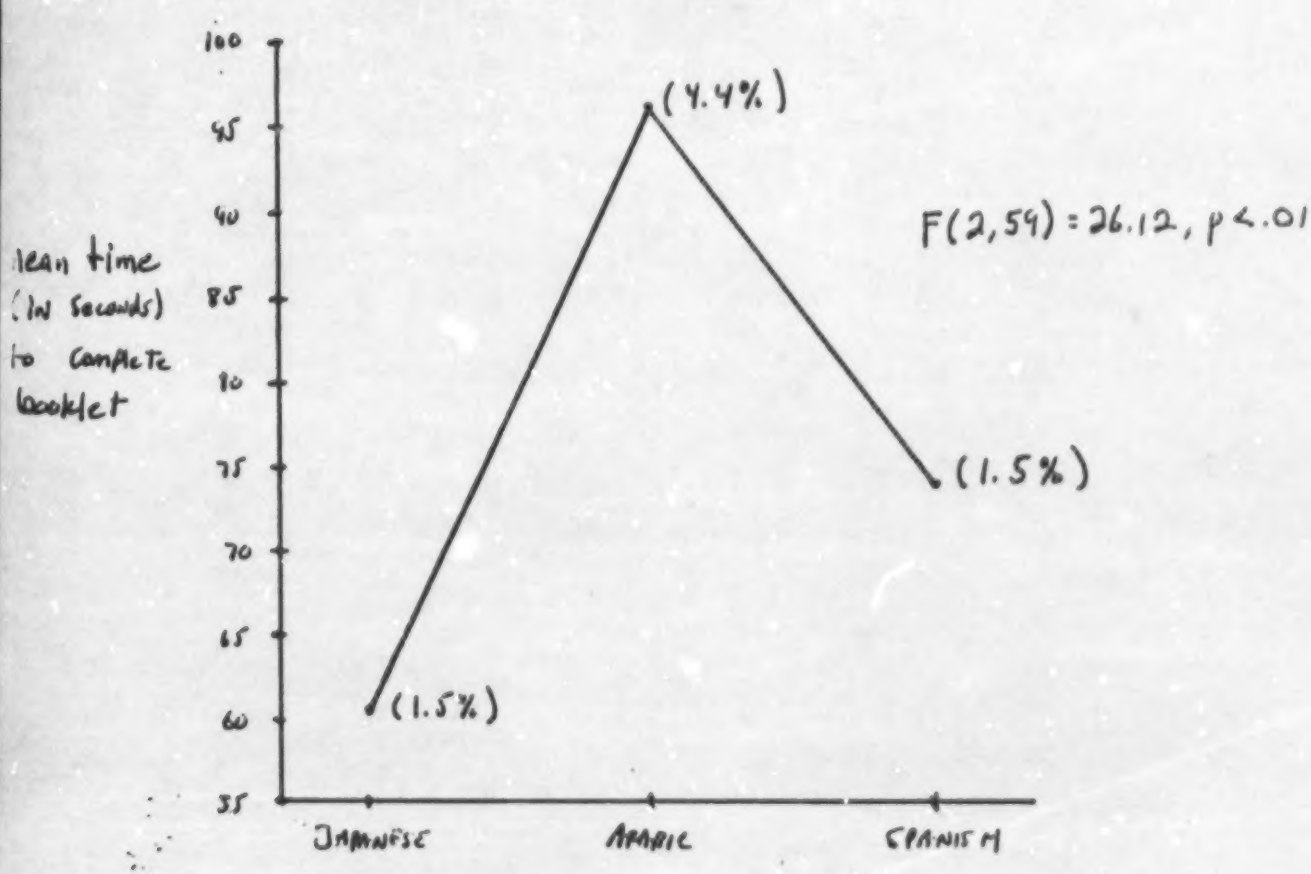
Figure 1: Mean completion times and Error rates for Japanese, Arabic, and Spanish speaking students on Same-different matching (with Percent error in Parentheses)



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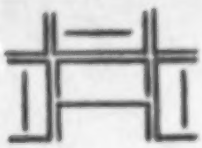
GURE 2: SAMPLE QUESTIONS FROM THE VISUAL DISCRIMINATION TEST

11.



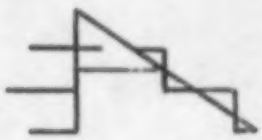
(a)

(b)

(c)

(d)

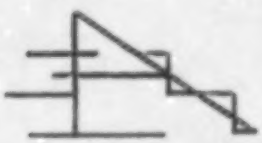
12.



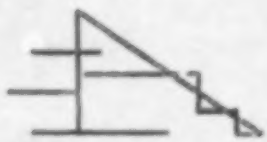
(a)

(b)

(c)



(d)



13.

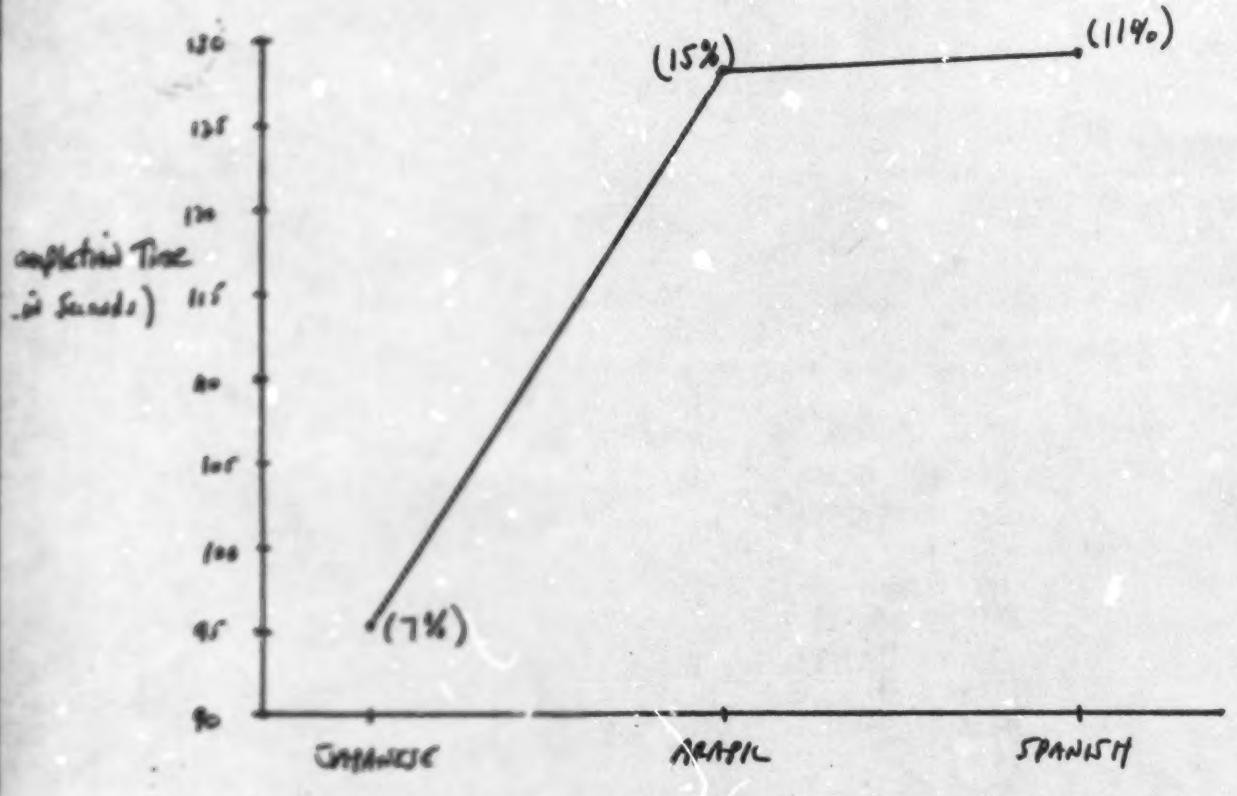
(a)

(b)

(c)

(d)

Figure 3: Mean Completion Times for Japanese, Arabic, and Spanish Speaking students on a test of Visual discrimination (Percent error in Parentheses)



FOR TIMES: $F(2,51) = 9.69$, $p < .01$

SNK SHOWS JAPANESE DIFFERENT FROM ARABIC & SPANISH

ERRORS: N.S.

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...Figure 4: Mean Reading times on Slosson Oral Reading Test (SORT)
(All effects significant at .05 or better)

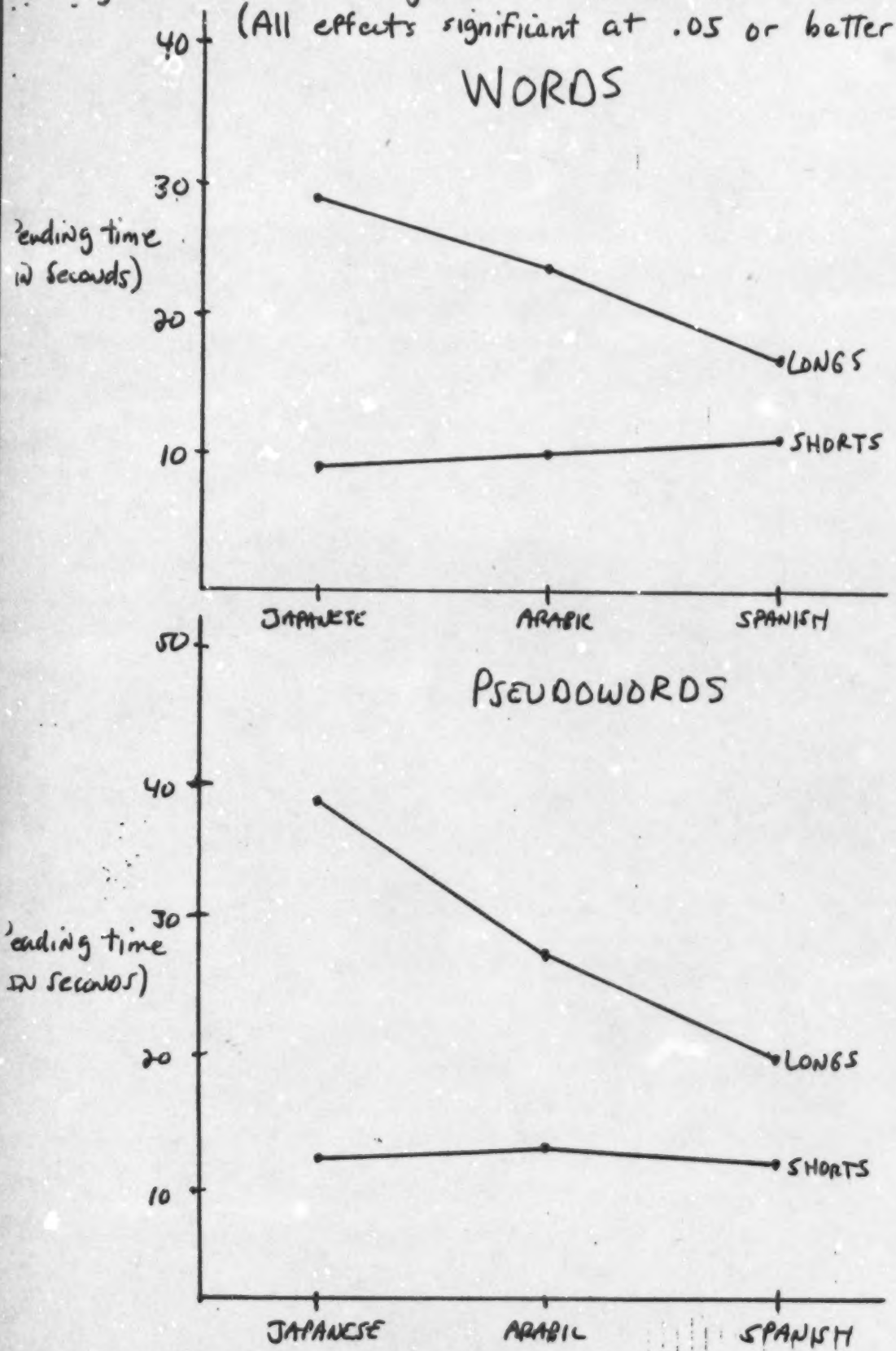


TABLE 1: Independent variables used in experiment 2

Variable 1: Language group (Japanese, Arabic, Spanish)

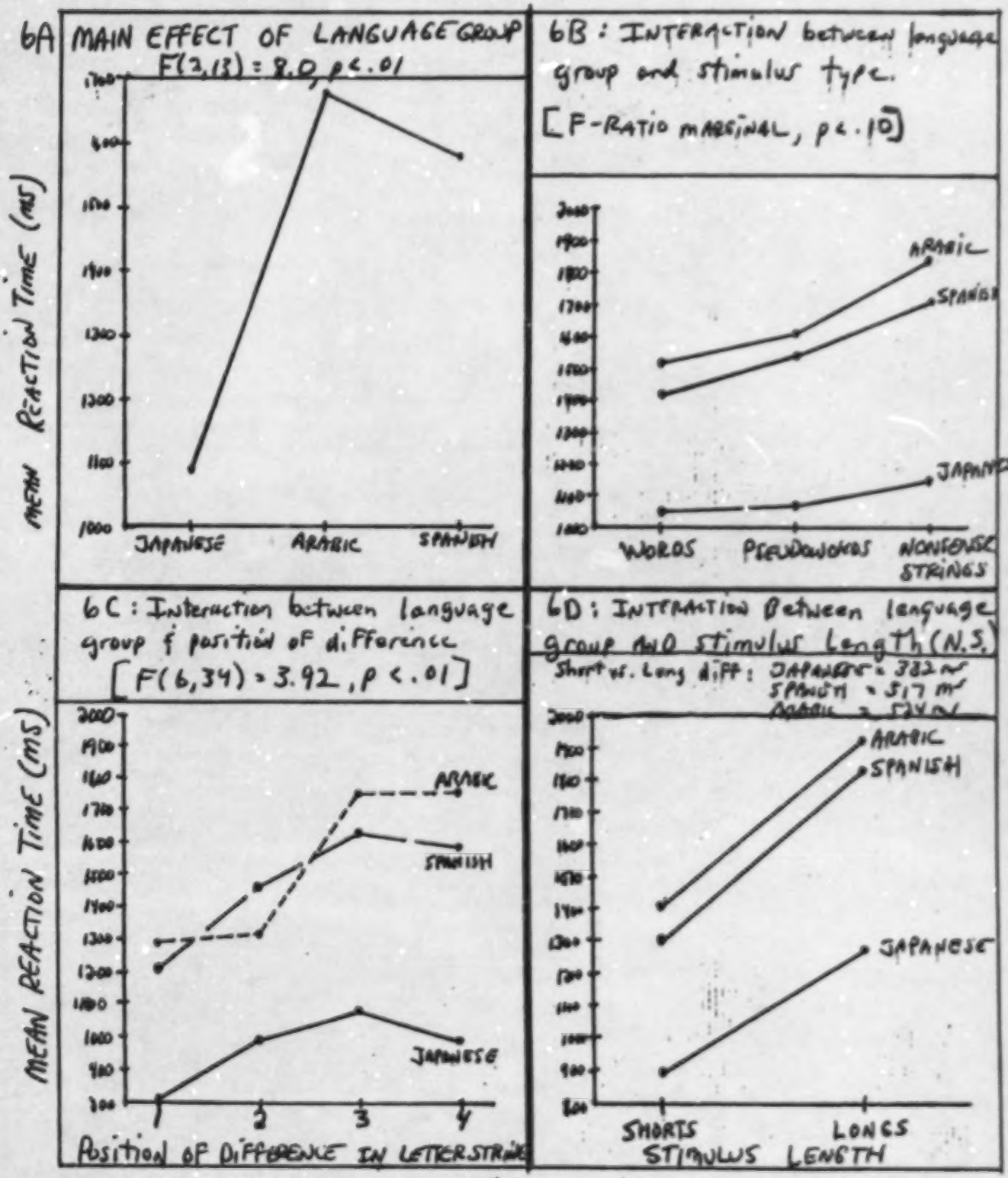
Variable 2: Stimulus length (short, long)
(short= 4 letters, long= 7 to 10 letters)

Variable 3: Stimulus type (words, pseudowords, nonsense strings)

Variable 4: Response type (same, different)

Variable 5: Position of difference in letter string (1,2,3,4)
(1= beginning, 4=end, 2 & 3 are medial)

FIGURE 6: SAME-DIFFERENT MATCHING DATA; EXPERIMENT 2



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